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of the Kansas station.—Otto Lugger in the January Bulletin of the Minnesota station, publishes a paper on "Frosted and Rusted Wheat," apparently being for the most part a compilation from various sources.—The Spotting of Peaches and Cucumbers is treated by Professor Arthur in the January Bulletin from the Indiana station. The disease on peaches is caused by *Cladosporium carpophilum* Thuem, and that on Cucumbers by *Cladosporium cucumerinum* E. & A. Figures are given of various stages of the fungi.

BACTERIOLOGY.[1]

THE BACTERIA OF SNOW.[2]—In many countries, during several months, snow forms the natural covering of the earth. Waste materials of all sorts, which collect in houses, etc., in many villages and small cities are thrown out directly upon the earth, and in the winter the snow takes the place of the earth in receiving and absorbing contaminating matters. In the spring, the water from the melting snow makes its way into the earth, carrying with it various impurities, some of which may be pathogenic. Whether any change takes place in them during the long time the snow lies upon the earth or whether they enter the earth unchanged, is a question of much importance.

According to the author of this paper, at the time of his writing, there was little or no literature concerning the bacteriology of snow. A number of investigators too, had worked on ice, but no where could he find any reports of examinations of snow. It remained uncertain whether its long stay on the earth changes the number or the character of the bacteria contained in it.

In the bacteriological examination of snow, it is obviously of first importance to secure it pure and free from accidental impurities, as it is often found, for example, on a large clear expanse. As it was evident that there would probably be a difference between snow which had lain long on the earth and freshly-fallen snow, the author made investigations of both kinds. Of fresh snow, some was caught, while falling, during a snow storm, in a sterilized tube. The snow so taken was melted in a water bath at 30° C. and .5 C.C. of this melted snow mixed with nutrient-gelatin. From this, plates were prepared in the usual way. Other samples of the same snow were also planted, and an average of these showed pretty well how many bacteria were ordinarily contained in such snow.

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[1] This Department is edited by Prof. Wm. T. Sedgwick, of the Mass. Institute of Technology, Boston, Mass., to whom brief communications, books for review, etc., should be sent.

[2] "Ueber den Bakteriengehalt des Schnees," von Th. Janowski. *Centralblatt für Bakteriologie* IV, 547.

To insure as exact results as possible, two samples of snow were always taken from different places, and as free from contaminating matters as possible.

From fresh, falling snow, the following results were obtained:—

Feb, 2, 1888. Average temperature, — 7.2°. C.
In the first sample 34 bacteria to 1 c.c. of melted snow.
In the second, 38.
Feb., 21, 1888. Average temperature — 11.1°C
In the first portion, 203.
In the second, 384.
Feb., 28, 1888. Average temperature — 12.2
In the first portion, 140.
In the second, 165.

Although these figures differ widely they nevertheless teach us something of the bacteriology of snow, and do not show wider differences than different examinations of ice, made by Fränkel, Prudden and others. A part of the bacteria found in snow are contained in the vapor when it crystallizes. Another, and the larger part, are filtered from the air by the cottony snow-flakes in falling. Consequently, the number of bacteria in the air must be much diminished, after a snow fall, and a true cleansing of the atmosphere appears to be accomplished, such as takes place during a rain. It is also clear that the cottony or wooly structure of the snow-crystal aids in producing this effect, in no small degree. Large differences sometimes noticed in like portions, might be due to the fact that during a snow storm, the snow may sometimes become mixed with impurities gathered from buildings in the vicinity, etc.

In studying snow which has been lying for some time Janowski took samples from the upper layers of snow which had fallen several days before, and which had since lain exposed to the air. In considering the results, it is important to know the range of temperature to which the snow was exposed. This was learned from the official weather reports at Kiew, where his investigations were made.

By means of a sterilized plate of glass he then removed the top of the snow, half a centimetre deep, on top of which the dust from the air rested. From the layer thus uncovered he took his samples and prepared plates as before.

Feb., 11. No snow since the morning before. Temperature during that time ranging from —8° to — 14°.

1st, in 1 c.c. snow water 2.
2nd, " " " " 4.

Feb., 15. No snow for four days. Temperature from —1 to —8°.

1st, portion 8 bacteria.
2nd, " 20 "

Feb., 24. Three days with no snow. Temperature between —11 and —21. Heavy frost.

1st portion 228 bacteria.

These figures seem to indicate that snow lying on the ground some time and exposed to low temperatures, always contains a considerable number of bacteria, and that the low temperature in winter exercises no considerable effect on the bacteria contained.

A number of different kinds of bacteria are contained in snow. Janowski found both those which liquefy gelatine, and those that do not, the former in larger numbers than the latter. He states that one point in particular interested him considerably, namely that he always found in plates from newly fallen snow, as in river water, many colonies which liquefy very rapidly while snow that has been long exposed to extreme cold contains few or none of these. He concludes that this kind, at least, is affected unfavorably by low temperature.—(*M. E. Dodd.*)

THE CHEMICAL ACTION OF CERTAIN BACTERIA.—A paper appeared in the *Journal of the Chemical Society* for August, 1888, by Robert Warington, on "The Chemical Action of some Micro-organisms." Some twenty of the organisms experimented upon were received as pure cultures from Dr. Klein, while six or seven others were isolated by the author himself. The action of these separate species was tested in four respects: 1. The hydrolysis of urea. 2. Action on milk. 3. Capacity for reducing nitrates. 4. Power of producing nitrification.

Warington finds that "the property of effecting the hydrolysis of urea is apparently but rarely met with among micro-organisms; in the present case, out of twenty-four organisms tried, only two could certainly be shown to possess it."

Of the action on milk he says: "The whole of the organisms which fail to gelatinise milk are organisms that do not liquefy gelatin. . . . On the other hand the whole of the organisms which act on milk as ferments liquefy gelatin. . . . . We may venture therefore to predict that every liquefying organism will be found capable of gelatinising the casein of milk."

As regards the reduction of nitrates, Warington states that out of twenty-five organisms seven were entirely without reducing power, one produced a mere trace of nitrite, and one only a very small quantity: the remaining sixteen reduced nitrates in broth, with considerable vigor. With the possible exception of one culture, the reduction to nitrites would appear to have occurred without the production of nitrogen, oxides of nitrogen, or ammonia.

The many investigations of the past few years on the relation of micro-organisms to the process of nitrification have met with little success so far as regards the isolation of a *specific* bacterium of nitrification. Warington's researches in this direction seem to have been little more fruitful than those of his predecessors. His experiments gave mostly negative results, and he concludes his paper with the observation: "An organism which nitrifies as soil nitrifies. has yet to be isolated."—(*E.O.Jordan.*)

BACTERIA, MICROBES, OR MICRO-ORGANISMS?—These terms are being used by various writers sometimes with precision but more often as synonyms. Etymologically "microbe" and "micro-organism" are equivalent terms, meaning simply "a little living thing." But "bacterium" meaning "a staff" is certainly not equivalent to the other two. An arrangement, perhaps as natural and simple as any, is to reserve the term *micro-organisms* for all forms of life which are so small that it is impracticable to study them to any great extent with the naked eye. "Micro-organisms" would then be a usefully indefinite term including many animals as well as plants, *e.g.* the protozoa, rotifers, many crustacea, indeed representatives of nearly every great group of invertebrates, diatoms, desmids, and other micro-algae, besides moulds, yeasts, bacteria, and other micro-fungi. The micro-organisms are only a general and very comprehensive group, divisible, for convenience, into two lesser groups.

These are, *1*, *the Microscopical* and 2, *the Bacterial micro-organisms.*

The *Bacterial micro-organisms* are those which are too small to be successfully studied individually and are best investigated in masses by special "cultures." They include the bacteria together with, perhaps, the yeasts and certain moulds.

The *Microscopical micro-organisms* are those which can be successfully studied by the microscope, individually, and without special "cultures." They include all animal micro-organisms, and all vegetal, excepting those just mentioned under the Bacterial division.

The term *microbe* may be left where it is now oftenest found,—in the newspapers.

The justification for such a classification as the above, is convenience, only. As a matter of fact quantitative ; estimates of the numbers of micro-organisms in any given sample of water, air, ice or snow, are of fundamental importance. At present the bacteria are estimated by cultures, and the other micro-organisms in ways entirely different.[1]

ZOOLOGY.

THE PHALANGES OF BATRACHIA SALIENTIA.—Professor Howes and Mr. Davies read a paper before the Zoological Society of London, Dec. 4, 1888, on the distribution and morphology of the supenumerary phalanges in the Anurous Batrachians. The authors described for the first time the primary mode of development of a supernumerary phalanx. They concluded that the same is in the Anura identical with the interphalangeal syndesmoses, and that the syndemoses and phalanges are derivatives of a common blastema. In its fully differentiated condition the structure in question was shown to be functional in receiving the direct thrust under the weight of the falling body in saltation; all the variations in structure being readily intelligible on that view.

The authors discussed the bearings of the facts upon classification and upon the broader question of the morphology of supernumerary phalanges in general. They showed that the facts of development indicated a probable intercalary origin of the latter from the interarticular syndesmoses; and that the numerical increase of the phalanges in the Cetacea may have been associated with the loss of ungues, somewhat similiarly to the way in which the multiplication of segments of the cartilaginous rays in the paired fins of the Batoidei would appear to have been connected with the disappearance of horny fin-rays.

The authors also showed that the Discoglossidæ alone among the Anura retained for life the undifferentiated syndemoses,

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[1] "A new method for the microscopial Examination of water." See *Science*, Feb., 15, 1889.